This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

GODFREY LOWELL CABOT SCIENCE LIBRARY
of the Harvard College Library

This book is
FRAGILE
and circulates only with permission.
Please handle with care
and consult a staff member
before photocopying.

Thanks for your help in preserving
Harvard's library collections.

REPORT

OF THE

Croton Aqueduct Department,

MADE TO THE

COMMON COUNCIL

OF THE

CITY OF NEW YORK.

DECEMBER 31st, 1851.

NEW YORK:
McSPEDON & BAKER, PRINTERS, 25 PINE STREET.
1852.

49.5T

Eng 1070.29

HARVARD COLLEGE
OCT 12 1891
LIBRARY.

Gift of
Dr. S. A. Green
of
Boston.

CROTON AQUEDUCT DEPARTMENT,

ORGANIZED UNDER A LAW OF THE LEGISLATURE OF THE STATE OF N. Y.,

Passed 11th April, 1849.

Board of Management.

NICHOLAS DEAN, President Commissioner.
THEODORE R. DE FOREST, Commissioner.
ALFRED W. CRAVEN, Chief Engineer.

EDWARD H. TRACY, Engineer.

Bureau of Sewers and Drains.

JOHN P. FLENDER, Chief, and Water Purveyor.

Bureau of Water Rents.

REVO C. HANCE, Register.
WILLIAM FARDON, Deputy Register.

To the Honorable the Common Council
of the city of New York :

The Croton Aqueduct Department presents this its annual

REPORT :

And for convenience of reference, arranges it under distinct and separate heads, as follows:

AQUEDUCT CONSTRUCTION ACCOUNT.

During the year the department has compromised with, and paid to Squire Wood, Jr., one hundred dollars, for damages sustained by him, in consequence of the erection of the Croton dam, overflowing during seasons of high water a portion of his farm, and rendering it too wet for cultivation ; and it has also settled with and paid to William Bolmer, his damages accrued by the opening of a waste weir on his farm, by which unauthorized and improper act a considerable ravine was cut, by the flow of water through his grounds, down a steep declivity to the Hudson river. It should be remarked that this happened during the annual visitation of the Common Council, some years since, on the line of the aqueduct, and was probably induced only by the desire to see the grand effect of such a volume of water rushing down the mountain slope ; that gratification has been purchased at a cost of four hundred and fifty dollars, as ascertained by the award of disinterested and competent referees. Upon the payment of these several amounts the parties executed full and satisfactory releases to the Corporation, which are on file in the office of the Comptroller of the city.

It is a subject of congratulation that these cases are the last of their class, and that now, after a lapse of more than nine years, since the first introduction of the water, every valid claim for damages growing out of the construction of the aqueduct, in the counties of Putnam and Westchester, is finally disposed of and extinguished. Such claims are now confined to this island only, among which, and holding a prominent place, is the suit of Stephen R. Clarke and others, against The Mayor, Aldermen and Commonalty of the city of New York. Since the commencement of this action, so many years have elapsed, that it is proper for the information of the present and incoming Common Council, briefly to state the prominent facts connected with it.

The suit was commenced in the month of June, 1844, to recover a balance of account, and damages alleged to have been sustained by the plaintiffs, as contractors for the construction of section 96 of the aqueduct, including the Receiving reservoir at Eighty-sixth street, in this city. The main point of controversy grew out of an order issued by the Board of Water Commissioners, in the month of May, 1840, directing that a certain portion of the Receiving reservoir should not be excavated to the depth originally contemplated by the plans and specifications prepared for the work; the plaintiffs contending that such order of the Water Commissioners was in violation of their contract, and that in consequence thereof they had sustained damages to a large amount. On the 22d day of January, 1845, the matters in dispute were referred to Messrs. William C. Bouck, David Hamilton, and James D. Wasson ; hearings were had before the referees, and on the 12th day of May, 1846, a report was made by them in favor of the plaintiffs for $50,949 06.

An appeal from the decision of these referees was then taken to the general term of the Supreme Court, where it was argued on behalf of the city, by James T. Brady, Esq., and on the first Monday of September, 1848, a majority of the judges, before whom such argument had taken place, affirmed the report of the referees, and judgment was thereupon entered against the city for $60,810 85, damages, interests, and costs. Judge Barculo, a member of the court, delivered a dissenting opinion in favor of reversing the finding of the referees.

From this judgment of the Supreme Court, an appeal was taken on behalf of the city, to the Court of Appeals. When the cause was reached it was again argued by Mr. Brady on behalf of the city, and on the second day of January, 1851, the Court of Appeals reversed the judgment of the court below, and ordered a new trial.

Subsequently, the cause was again brought on for trial, and Mr. Brady being absent in Europe, Charles O'Conor, Esq., was retained as counsel for the city, and Peter B. Sweeny, Esq., who had previously been connected with the suit, and familiar with all its details and proceedings, was also continued as counsel on the part of the city. On the 27th day of May, 1851, the cause was again referred, Levi S. Chatfield, William J. McAlpine, and William Eagleson, Esqs., were appointed referees. Before these last referees several hearings have been had; Mr. Brady having in the mean time returned, and with Mr. O'Conor is again acting as counsel for the city; and but for an injury sustained by Mr. Eagleson, which prevented him from meeting with his co-referees, it is quite probable that a report would have been had from them during the current year.

The suit still remains undecided, and from its importance in the amount involved, has claimed and received from the department the most anxious attention: Mr. Tracy, one of the engineers, long connected with the aqueduct, having in fact devoted a large part of the summer to collecting documentary and other testimony, to be used on the hearing of this cause before the referees, and in pursuit of which he has been compelled to make several journeys, one as far as Chicago. In the proceedings connected with this suit, the department has, from time to time, consulted with Henry E. Davies, Esq., the Counsel of the Corporation, and in the employment of counsel, and other matters, have acted with his approval and concurrence.

After completing the dredging of Harlem river, between two piers of the High bridge, referred to in the last annual report, it was found that the rush of water through the opening thus made was so great during the alternate flow and ebb of the tide as seriously to impair, if not to defeat the navigation of it, except at slack water. Having on the spot all the machinery required to continue the work, and being aware that the owners of property on the margin of the river above, would insist upon their rights to the use of these waters, and their restoration to a condition suitable for navigation, the department directed the excavation to proceed until a depth of eight feet at low water should be had between the next contiguous piers. This has been completed, and it is thought that no further expenditures for this object will hereafter be required. The items and aggregate amount of disbursements under the head of "Aqueduct Construction Account," appear in Schedule A, of the Appendix.

AQUEDUCT REPAIRS AND IMPROVEMENTS.

It had been for some time observed that the reflux of water below the dam at Croton river, was excavating the channel immediately below the apron, and would ultimately, if its progress were not stayed, undermine that structure and endanger the permanency of the dam itself. Advantage was taken of the low stage of water during the months of August and September, when none passed over the dam, to repair the damage already done, and effectually to prevent its recurrence. A strong force of men and teams were placed on the work ; heavy boulders were procured from the dry bed of the river below, and hundreds of tons of these thrown in below the apron, filling the entire chasm, and by their great weight offering such resistance to the action of freshets hereafter, as not only to assure their remaining in position, but also of their sufficiency to protect the dam and its appendages from like danger in future.

On the margin of the Croton river extensive repairs have been made on the line of the aqueduct, and new and stronger walls built to sustain the embankment on the steep hill side, in places particularly exposed to accident; nor has any point on the entire line been neglected, in the anxious supervision constantly bestowed upon the work. The retaining curb walls, on three sides of the Distributing reservoir, referred to in the last annual report, have been completed, of increased thickness and strength, and a contract made for heavy granite coping, with which to cover them, to be delivered on the ground, on or before the first of March next. To protect the terraces sustained by these walls, and such shrubbery, climbers, and flowering plants as should be cultivated upon them, it is indispensable that an iron railing be placed upon the coping; if this were done, a very little care, annually bestowed in planting and beautifying these grounds, would render them, in connection with the reservoir, one of the most attractive spots on the island. The department, in its prospective estimates for the year 1852, has not included the cost of this railing, but intends, after receiving tenders for its erection, to submit them in a special communication to the Common Council.

The expenditures under this head will be found in Schedule B, of the Appendix.

During the next year a considerable outlay of money will be required on the great embankment over Saw-mill river, at Yonkers. This embankment has always exhibited less of care and solidity in its construction than generally marks the line of the aqueduct; it has therefore required and received more attention and watchfulness, and though not yet showing any very decided symptoms of displacement in any part of the structure, prudence requires that strong sustaining walls should be built outside of the present embankment, filled in between, and carried up to a sufficient height to assure the thoroughness of the work hereafter.

For the purpose of procuring earth for this filling, it will probably be necessary to purchase by private contract, or take by appraisement under the general railroad law, an acre or two of ground, as near the point of repairs as practicable. It is not expected that the whole of this work will be completed during the next year, the appropriation asked for being limited to such sum only as will commence and carry it forward to a point of present safety.

The line of aqueduct, passing as it does for many miles through a rich and populous country, intersecting several villages, and studded in its whole length with country seats, frequently cutting through orchards, court-yards, gardens, and pleasure-grounds, subjected the owners, in its construction, to great annoyance and inconvenience; to lessen which as far as practicable, the engineers in charge of the work, as well as the Board of Water Commissioners themselves, did not rigorously insist upon the removal of all trees and shrubbery from the grounds purchased, through which the structure was to be built, but left them often in close proximity to the line of excavation, and within such distance as rendered it too probable that the roots might, at some future day, reach the structure and penetrate through the brick work. This anticipation has been verified. During the examination of the interior of the aqueduct in December last, it was found in the vicinity of Sing-Sing that the root of some tree or shrub, had found its way through the crown of the arch, penetrating the cement in which the bricks are laid, and which is as hard as the bricks themselves, and had reached in six months a length of more than twenty feet.

As no tree was growing within a distance likely to send its roots to the point where these were found, some curiosity was felt to ascertain to what particular kind of tree it belonged; it was therefore carefully removed by Mr. Tracy, placed in water, brought to the city, and submitted to the examination of Dr. Torrey. From him the following letter was received:

"College of Physicians and Surgeons,
No. 67 Crosby st., Jan. 16, 1851.

"Dear Sir:—I have examined the vegetable matter taken from the Croton aqueduct, which you left with me yesterday. It is not a fungus, or any other unhealthy material, but consists of the roots of trees (probably of the willow) which have penetrated minute fissures of the masonry, and on reaching the cavity of the aqueduct, where everything was favorable to their development, have attained to an enormous length. The introduction of these roots is no doubt injurious to the masonry by their mechanical action, for by their gradual increase of diameter, an irresistible force is generated, which will in time produce great displacement of the stones. The growth of trees immediately over, or even very near the aqueduct, should be prevented, as they may cause serious damage to this invaluable structure.

"I am, dear sir, yours, truly,

JOHN TORREY."

"Edward H. Tracy, Esq., Engineer," &c.

The present Board, in the earliest period of their duties, observed with alarm, the numerous trees and extensive plantations of shrubbery, at various points along the aqueduct, on the grounds belonging to the city, and took early steps to have such of them removed, as from their position gave good reason to suppose might eventually prove injurious; some of them have been removed; but this request, like every other made to the owners of land adjoining the aqueduct, if at all interfering with their interests or their convenience, is met with reluctance, and almost invariably postponed or evaded. Indeed, it has at all times been difficult to convince most of them that in selling and conveying their lands to the city, they parted with any thing more than a right of way *underground*, and that the surface, for all purposes of agriculture and every kindred pursuit, remained to them as perfectly as before the execution of their deeds of conveyance.

In the last annual report from this department, this subject of title was particularly referred to, and the Common Council informed that an action for trespass, in destroying a fence erected to protect the aqueduct from injury, had been commenced against an individual, resident on the line of the aqueduct, at Tarrytown, for the purpose of ascertaining the rights of the city, and settling definitively this vexed question; that upon the trial of the cause at the Westchester circuit, before Judge McCoun, of the Supreme Court, under a very pointed charge from the bench, the jury found for the defendant. To the ruling of the court exceptions were taken by the counsel for the city, which were subsequently argued before the Supreme Court, and by that court, Barculo, Justice, the decision below was rendered:

"These propositions seem to be quite clear."

"1st, The plaintiffs have the right to fence any part of the aqueduct in their discretion, and their acts are conclusive as to the propriety of so doing. This right does not depend upon the statute requiring it to be done at their expense, but existed prior to that statute.

"2d, The right is subject to the duty of erecting and sustaining convenient passes across, or under the aqueduct, wherever it intersects land belonging to an individual, for the farming and other purposes of the land. Sec. 4 of the Act of 1836, Laws of 1836, p. 709.

"3d, The defendant not owning both sides of the aqueduct, his land is not intended within the meaning of the act, and he is not entitled to any passes across, or under the aqueduct, by virtue thereof.

"4th, defendant's right of crossing the *locus in quo*, must depend upon the common law doctrine in regard to ways of necessity, and must be sustained by proof that he has no other reasonable mode of passing to the public highway.

"5th, If there is a highway laid out and opened, as appears by the map, contiguous to the south side of the defendant's lot, he has no right to cross where the fence was erected, and is a trespasser in so doing.

"6th, Even if it be conceded that the defendant had a right to cross the aqueduct, he was not justified in removing the whole line of the fence for that purpose.

"7th, The judge at the circuit entertained incorrect views of the law, and submitted the case erroneously to the jury.

"8th. The judge erred in charging the jury that it was for them to consider whether the order to fence was based on an honest judgment of its necessity to protect the aqueduct from injury.

"9th, The erroneous charge has probably produced an erroneous verdict, and a new trial should therefore be granted."

The cause was again tried in June last, ta the Westchester Circuit, Barculo, justice, and under the law governing the case, as above settled by the Supreme Court, the jury found a verdict for the plaintiffs, for nominal damages only,—no more being asked for, as the trespass involved the title to land, and these would carry costs.

In this verdict the defendant has acquiesced, and the perfect and entire control of the city over these lands, for all purposes necessary to protect the aqueduct, and its appendages from injury, being thus established, this department is relieved from all the doubt and uncertainty which have hitherto modified its action, and may hereafter proceed with confidence in the discharge of its duties. These require that all trees and shrubbery standing upon the aqueduct grounds, the roots of which by any possibility might penetrate the structure itself, should be removed or cut down. To carry out this object with the least injury and inconvenience to parties interested,—a principle always governing this Board in every case,—when the proper season shall have arrived in the spring for removing trees, notice will be given to the owners of them to take them away and transplant them on their own grounds, if they deem them worth the trouble and expense, but should such notice be neglected, or contemned, this department will afterwards proceed to do its duty, by destroying them.

EXTENSION OF THE WORKS.

In anticipation of the necessity of large expenditures in the erection of new works, as the growth of the city, and consequent increase of population should demand them, as well as to relieve the citizens from the annual imposition of taxes to meet the cost of these extraordinary and permanent structures, the legislature, by an act passed 12th March, 1849, entitled "An act to enable the Mayor, Aldermen and Commonalty of the city of New York to extend the Croton water works," provided as follows:

"§ 1. It shall be lawful for the Mayor, Aldermen and Commonalty of the city of New York, to raise by loan, from time to time, in such amounts as they may deem necessary, a sum not exceeding six hundred thousand dollars, by the creation of a public fund or stock, to be called 'The Water Stock of the city of New York, of the year one thousand eight hundred and forty-nine,' which shall bear an interest not exceeding five per cent. per annum, and which shall be redeemable at a period of time not less than twenty nor more than fifty years after the passage of this act.

"§ 2. It shall be lawful for the said Mayor, Aldermen and Commonalty to determine what shall be the nominal amount or value of each share of the said stock, and of what number of shares the same shall consist, and they are hereby authorized to sell and dispose of such shares, at or above the par value thereof, either at public auction, or private sale, or to raise the said sum by subscriptions for such stock, in the mode in which such stocks are usually subscribed for.

"§ 3. All the provisions of the law heretofore passed, pledging the faith of the city of New York, and providing a sinking fund for the redemption of the stock issued by virtue thereof, are hereby made applicable to the stock issued in pursuance of this act.

"§ 4. The moneys to be raised by virtue of this act, shall be applied and expended to and for the purpose of purchasing ground, if necessary or expedient, of building an additional reservoir, of laying new mains, and increasing the supply of water in the city."

The whole law is copied here, as well for convenience of reference, as to enable the Common Council to see at a glance the source, and amount of means applicable to the purposes and objects hereinafter suggested and discussed. Of the six hundred thousand dollars so authorized to be raised, portions have already been used in laying down the great main, from the Receiving reservoir through Fifth avenue, Seventy-ninth street, and Third avenue to Fourteenth street; in connecting this line from Third avenue, through Forty-second street, with the Distributing reservoir; and in connecting the influent with the effluent pipes at the latter reservoir, through the Fifth avenue, made for the purpose of assuring a supply of water, independent of that reservoir, should extensive repairs hereafter be required upon it; and also, when drawn off, for the purpose of cleansing it. Other portions have been applied to the renewal of stop-cocks, on the great lines of supply, by substituting new ones of better construction, opening horizontally, and placed in capacious vaults, for convenience of access at all times, without disturbing the street pavements.

Deducting these drafts upon it, there yet remains of the stock above authorized to be issued, the sum of $344,400.

First in importance and magnitude of the prospective expenditures under the head of "Extension of the Works," is the purchase of ground for, and the erection of a new "Grand reservoir." When the department, by a resolution of the Common Council, received the necessary authority to enable it to make purchases of ground for this purpose, it was hoped that after the site was definitively fixed upon, some saving in cost might be made by employing a judicious person, unconnected with this Board, to make these purchases by private contract, and that in this way a considerable portion of the required area might be obtained, before the public should be aware of its intended locality; in pursuit of this object, maps showing all the lots proposed to be taken, with the owner of each written in, were compiled from the tax office. But upon looking carefully into these, it was found that the titles to large portions of the plot were held, either in common among several owners, in trust, or by devise vested in infant heirs. Moreover, the minuteness of the surveys about to be made in the large number of cross-sections, the cutting away of under brush and intervening objects; the soundings to determine the character of the strata below the surface, and the general array of preparation would, without other causes, have effectually defeated all privacy in the matter.

It is now generally known that the locality selected is between the Fifth and Seventh avenues, and Eighty-sixth and Ninety-fifth streets, forming a quadrangle of nearly equal sides, and containing an area of ninety-six acres.

This plot is a natural basin, much of it below the assigned grade of that part of the city, nearly in its lowest depression, and almost without excavation or improvements of any kind—the few buildings standing upon it being of trifling value; surrounded on its easterly and northerly sides by natural ridges of land, and requiring expensive sustaining walls, only on the westerly side along the Seventh avenue, and a part of its southern boundary on Eighty-sixth street. A ravine connects the northerly side with the East river, through which a sewer may be constructed to draw off its waters when necessary for repairs, or for cleansing it; and with a small outlay like facilities may be had from its westerly side to the Hudson river, enabling the Engineer Department to adopt either the one or the other, or both, as in the progress of the work may be deemed expedient. Its close proximity to the receiving reservoir, separated only by the width of Eighty-sixth street, (one hundred feet,) renders the connection of the two easy and inexpensive by pipes carried under the street, and a branch of a few hundred feet through from the aqueduct, will furnish the means of filling it wh Seventh avenue, completed.

Upon the easterly and westerly margin of the rock of good quality is found cropping out, from wh may be quarried all the stone required for exterior interior walls; and the excavation of the enclose will furnish, it is expected, all, or nearly all the ear ing between these walls. The drawings, now in vanced stage of progress, will determine definit correctness of these estimates, so important in ing the cost of the work. Should a deficiency be found, that deficiency can readily be supplied in the neighborhood.

In addition to all these manifest, and indeed remarkable features of peculiar fitness, offered by this plot of ground, for the purpose to which it is to be dedicated, it has the further advantage of being now owned to the extent of more than one-quarter of the whole, by the city, and in that proportion lessening the drafts upon the treasury for its purchase.

The fourteenth section of the act to " Create the Croton Aqueduct Department in the city of New York," passed the 11th of April, 1849, provides,

" The Croton Aqueduct Board are hereby authorized to enter upon any land or water for the purpose of making surveys, or laying mains and pipes, or constructing reservoirs, and to agree with the owner of any property which may be required for the purposes of this act, subject to the ratification of the Common Council. The Croton Aqueduct Board, in behalf of the Mayor, Aldermen and Commonalty of the city of New York, may enter upon, take possession of, and use all such land, real estate and property as may be required for the purpose of making such surveys, or laying mains or pipes, or constructing reservoirs, sewers, and drains, and the convenient accommodations appertaining to the same, they making compensation therefor, in the manner provided in and by the act, entitled ' An act to authorize the formation of Railroad Corporations,' passed March 27th, 1848, except that the Commissioners of appraisement to be appointed by the court shall be appointed as follows, that is to say, one on the nomination of the said

Croton Aqueduct Board; one on the nomination of the other party or parties to the proceeding, if they shall agree on such nomination; and the other on the selection of the court; but nothing herein shall restrain the court from rejecting any nomination which shall be made by a party, and disapproved of by the court for cause; such commissioners shall each be allowed three dollars a day for his services."

Under the power thus delegated, proceedings will be had to vest the title to the whole designated area, in the city; and as all the preliminary surveys, and illustrative drawings, are in an advanced state towards completion, it is expected that such ownership may be acquired within the next six months. This done, the department will feel that a most important step has been taken in the great work, by protecting the city from the payment of the increased value which the lapse of a few years will confer upon these grounds.

The construction of the reservoir itself is a matter that may, or may not be deferred, as the wisdom of the Common Council shall determine, in view of all the circumstances connected with it.

It was stated in the last annual report from this department, and the fact remains unaltered, "that the last drop of water which the works in their present state can supply, is now daily delivered in the city;" it follows, therefore, that if the proposed reservoir were now built it could not be filled, and would remain a useless structure, till such alterations and additions were made on the line above it as would enable the department to deliver an increased quantity of water daily.

It has not been the policy of the present Board to review and criticise the acts of their predecessors in office, nor would it now do so if the subject under discussion did not render it necessary. A grave error has been committed in the means of getting the water over Harlem river. While the most liberal and enlarged views were adopted in the construction of the aqueduct down to that point, its capacity being more than equal to the whole flow of the Croton river, at an average stage of its waters, and capable of delivering daily more than 60,000,000 gallons; to cross the river two lines of three feet iron pipes were laid, in the form of an inverted syphon, limiting the supply to half the quantity last named, and to make the syphon do that work, losing a head of two feet, which had been maintained at great cost by bridges and embankments, through a distance of thirty-three miles! Had the High bridge been carried up to the line of the aqueduct, an additional height of fourteen feet, for which it cannot be doubted the piers are abundantly strong, the masonry of the aqueduct proper could have been continued over it, and the bridge itself protected from the danger of leakage, by a metal lining of the aqueduct, as at Sing-Sing kill and Clendenning valley, thus pouring upon our own island the whole volume of the Croton river, at an elevation above tide water of one hundred and seventeen, instead of one hundred and fifteen feet.

It is presumed that a saving in the cost of the structure was probably the controlling motive in adopting the plan as it now stands; this saving may have been equal to a hundred thousand dollars, and perhaps rendered imperative by the then existing state of the funds applicable to that object; but if so, it would not form an excuse for placing on that bridge the two lines of small pipes now occupying it, in view of the then admitted fact, that a few years would prove them unequal to furnishing the required daily supply of water to the city, and force upon it the necessity of taking them up, and substituting others of larger size, or of continuing the aqueduct itself over the bridge in the manner above suggested. That time seems already to have arrived, for one of these works must precede the construction of the proposed reservoir to make it of any value. In this connection also, additions must be made to the works through Manhattan valley, by laying down two more lines of three feet pipes. These will be in part furnished by those taken up at the bridge, should it be determined to continue that mode of conveying the water across.

It will readily be seen that the alterations and additions indicated, involve not only a large amount of money, but difficulties and responsibilities which this Board would greatly prefer not to encounter. The taking up and re-laying of the pipes on the bridge, would be at any time, and under the most favorable circumstances, a formidable undertaking, but to do it now, and keep up a supply of water for all domestic and manufacturing purposes, while the work shall be in progress, adds immeasurably to those difficulties, and furnishes strong reasons in favor of constructing the aqueduct over it, and leaving the pipes upon it undisturbed.

There are parts of the island this side, as well as beyond Manhattan valley, far above the level of the aqueduct, which can only be supplied with water by the intervention of steam machinery to force it to the required elevation. That part of the island known as Mount Prospect, over the

Harlem tunnel, is one of these points, so also is that district in and about the Lunatic Asylum. The rapid increase of population will at an early day, cover these eminences with dwellings, and force the city government to provide for them an indispensible necessity—a supply of water ; nor is the period a remote one, when the vicinity of Fort Washington will claim and enforce the enjoyment of like privileges.

To meet these prospective demands, economy suggests the propriety of selecting and securing proper sites for the erection of two small Distributing reservoirs, while land is yet comparatively cheap.

In placing before the Common Council these remarks, under the head of "Extension of the Works," the department has felt it to be a duty to examine the whole ground, as well to direct the attention of the city government to the different details, as to disabuse the public mind of a too prevalent idea that the Croton water works are finished ; that little expenditure will hereafter be required ; that its revenue should be collected through the Tax office, *and the Department be abolished.*

The disbursements under this head for the past year will be found in Schedule 3, annexed.

WATER PIPES AND LAYING.

For these objects $187,498 12 has been expended since the last annual report, the particulars of which appear in Schedule C. The locality and length of the various lines laid, are detailed in Schedule D, showing an aggregate of twelve miles, nine hundred and twelve feet being an increase of four miles nearly, beyond the sum of last year's work. The large main of twenty inches diameter, in Thirty-eighth street, from Fifth to Tenth avenue, included in the working plan for 1851, has not been completed, owing to the gross default of the contractor on the sewer, in a part of that street; by the terms of his contract this was to have been finished early in August last, and in the full expectation that it would have been so finished, the pipes referred to above, were procured at an early day, proven, paid for, and mostly placed upon the ground. The department was exceedingly anxious to have completed this job, inasmuch as that part of the city about the intersection of Tenth avenue and Thirty-eighth street, is not sufficiently supplied with water to protect it from an extensive conflagration, should a fire unfortunately commence there; nor is it probable, judging from the past, that the sewer will be completed till late in the spring, thus compelling the department to postpone a work of urgent necessity, for months to come.

A twelve inch line has been laid from Eighty-sixth street, Yorkville, through the Third avenue to Harlem bridge; much of this line was through rock excavation, and it had also to overcome the impediment offered by crossing Harlem creek.

The lines supplying Randall's and Ward's Islands, have been connected with it, assuring hereafter a full supply of water to the public benevolent institutions on these islands. This line on the Third avenue is now continuous throughout its whole length, with the exception of that part contained between Sixty-second and Seventy-ninth streets;

this must wait the completion of the amended grade of that part of the avenue, which is designed to lower the elevation, of what is known as Flynn's hill, several feet. The break in the line does not, however, affect the supply at Harlem, that being drawn directly from the Receiving reservoir, and is sufficiently copious to warrant the erection of numerous manufactories, requiring steam machinery.

The line of gutta percha pipe put down last year from the foot of Seventy-ninth street, across the strait, separating this Island from Blackwell's Island, to furnish water to the latter, and which, in the last annual report, was referred to as imperfect in its manufacture, and not expected to last very long, gave out during the past summer. When this line was extended across the river, and just at the critical moment of dropping it into place, the arrangements made for the purpose were broken up, by being run into by a vessel navigating the river; some of the anchors, designed to hold the line firmly on the bottom of the river, were displaced, and on taking it up, it was found that in consequence of the accident above referred to, a distance of some fifty feet was unprotected by these anchors ; the shifting, and very rapid tides had swayed this part of the line backwards and forwards, till the sharp rocks had worn two holes through it, sufficiently large to lessen the quantity of water delivered, and to require its being taken up. A very careful examination proved that the material had not undergone the slightest change during the period it had been submerged, but was as bright, fresh, and clean, externally and internally, as when delivered from the manufactory ; and though known to be, originally, thinner and weaker than it was intended to be, it gave conclusive evidence that but for the accident referred to, it would have performed its work for a long series of years.

New pipe of the same material was ordered, of greater thickness and improved manufacture, heavier, and a greater number of anchors were arranged upon it, and through the persevering and skilful arrangements of Mr. Craven, Engineer-in-Chief, it has been successfully placed in position. Should no unforeseen disaster happen, as from being caught by a vessel's anchor, or some similar casualty, it is expected to last longer than any metal pipe would. The writer in justice to Mr. Craven remarks, that the public cannot appreciate the energy and skill exhibited in the performance of this service, nor the numerous difficulties met and overcome by him in his progress.

Extensive alterations of the grade of the Fifth avenue are contemplated, which, if carried into effect, will interfere with the two great mains lying in that avenue, through which the two reservoirs are connected; in some parts the filling will bury the pipes to a depth of nineteen feet below the surface,—requiring them to be raised for hundreds of feet,—in other parts, as between Forty-ninth and Fifty-third streets, they must be lowered through solid rock, at the deepest point ten feet; but as the period when this work is to be done, is not yet determined, no estimate of its cost has been included in the appropriation asked for 1852. Sundry petty cash receipts, during the year p
for old brass and copper, scrap iron, and other article
have amounted to $1,243 26, which has been p
the city treasury.

sold,
aid into

INCOME FROM WATER RATES.

The ordinance amending and reducing these rates, passed by the Common Council on the 20th of March, 1851, was estimated as equal, in the aggregate, to a diminution of $45,000 in the annual receipts. Schedule E, in the appendix, shows the income for the past year to have been $451,665, and beyond that of 1850 by the sum of $1,931 10. The rapid extension of the water district, the constant accumulation of statistics relating to its consumption, the graduation of charges in the miscellaneous rates, corresponding to such consumption, and the experience acquired in the Bureau of the "Water Register," have all aided in producing this satisfactory result. If the rates now established, which are lower than those of any city in the country, equally well supplied, with the exception of Philadelphia, remain undisturbed; this progressive increase will continue from year to year, and soon pour into the Sinking Fund an amount sufficient to extinguish the debt created by the introduction of the water. Schedule F, shows the sum received for interest on unpaid rates $7,124 83, being less than the amount derived from the same source last year, by $2,093 14. This decrease is owing entirely to the greater promptness of water takers in paying their rates, before the charge for interest had attached.

WASTE OF WATER.

The measures adopted by the Board to arrest this evil, though perhaps scarcely apparent to the public eye, have nevertheless produced a beneficial effect. Contrary to the expectations expressed in the last annual report, the unauthorized opening of fire hydrants has been almost entirely suppressed, and the control of the various branches through which water is delivered along the rivers to steamboats and other vessels, has been assured by placing stop-cocks at the bulkhead in each line, enabling the department promptly to punish every violation of its rules, in regard to waste, by shutting off the supply. All the taps inserted in the street mains, are now subjected to proof by hydraulic pressure before they are used. It is believed that the former imperfection of these, and the frequent slight settlement and displacement of street mains, taps, and service pipes, caused by the construction of sewers, produce in the aggregate a vast amount of leakage, though singly too minute and powerless to force its way up to the surface. If the building of sewers had preceded the laying of pipes, which seems to be the natural order of doing the work, this source of waste would have been prevented. There are in the city a great number of small jets, with basins beneath, on the counters of groceries, and bar-rooms, confectionaries and bakeries, the discharge from which is generally either carried into sewers, or passed to the street gutters, beneath the flagging of the side-walk;—these, viewed separately, seem trifling affairs, and incapable of producing any marked influence upon the general supply; but under the pressure of a head of more than a hundred feet, which in many cases is the fact, a small orifice will discharge a prodigious quantity of water in the course of a year. A systematic effort has been made to ascertain the number of these, and to collect from them the revenue which the ordinance has defined. The free use of these, as in all other cases where privileges undisturbed have been long enjoyed, is now claimed as a right, and payment for them has been met with opposition and grumbling. In one case, where a party was charged nine dollars for a jet upon his counter, he paid it with such strong expressions of the imposition practised upon him, as induced the writer to visit his place and guage the quantity of water actually flowing from it. It was found to discharge half a pint every ten seconds, and as it was admitted that the flow continued throughout the entire year, it follows that one hundred and ninety-seven thousand one hundred gallons annually is thus wasted—equal to furnishing a family of twenty persons, each with twenty-seven gallons of water daily, for the whole period. Had the rate fixed by ordinance of three and a half cents per hundred gallons been charged in this case, as it ought to have been, the amount collected would have been sixty-eight dollars and ninety-nine cents, instead of nine dollars. The jet referred to, is not larger, perhaps smaller, than the average of those used for similar purposes. The investigation intended to give the department a thorough knowledge of all these fixtures, though commenced is, as before stated, not completed ; but it is thought to be largely within the truth, to assume, that there are in the city five hundred of them, discharging as much water as the one above described ; if so, an annual waste of one hundred millions of gallons is shown from this source only !

It cannot be very long before necessity will compel the passage of an ordinance abolishing these jets altogether, or compelling the payment of an annual charge at least five times as great as that now imposed.

The great outlets of waste are, however, to be sought for in other quarters ; among these street washers are still prominent, consuming incalculable quantities of water to no useful purpose whatever ; millions of gallons are worse than wasted, in flooding instead of sprinkling the streets, ruining the pavements, and leaving them a mass of mud during the summer months ; and to these, add the hundreds of streams kept running in stores and warehouses, communicating with sewers in the lower wards, throughout the year, and the catalogue will begin to show its enormity. In the cause of waste last specified, it is not unusual to find written in conspicuous characters over water closets and urinals, "leave the water running." To stay these accumulated abuses, the department is at all times exerting the power and influence it possesses, but without the aid and support of consumers themselves, its progress, in so herculean a work, must necessarily be slow and unsatisfactory. Whether such aid will ever be extended to it by an economical use of water, short of the suffering produced by a deficient supply, is perhaps not to be expected. Bad habits are already too thoroughly rooted, and privileges for which a daily thanksgiving should be offered, are so commonly and so constantly abused, as scarcely to find a rebuke in the best regulated families. Would these families tolerate a like waste *in other and less necessary supplies ?*

If it were possible to circumscribe the use of water to indispensable purposes only, furnishing for these the most liberal supply, no addition would be required to the works for the next twenty years, except to guard against accidents to the aqueduct itself, by having the means of storing an increased quantity on this island. In this is found the reason for a new reservoir ; *a prudential measure only, indicated by the possibility of such accident.*

The following table shows the average depth of water in the distributing reservoir for each month in the years 1849, 1850, and 1851; in August of the former year, the present Board came into office, but was not fairly organized till the close of that year.

MONTHS.	1849.	1850.	1851.
	FEET. INCH.	FEET. INCH.	FEET. INCH.
January	26.4	30.11	26.11
February	26.1	33...	29.6
March	27.1	33.6	31..
April	28.2	33.2	31.10
May	24.9	33.10	31.4
June	25.4	31.11	29.5
July	25.9	28.1	28..
August	26.2	27.8	29..
September	25.8	29.3	27.3
October	27.2	28.10	29.3
November	24..	30.11	30.4
December	26.8	26.1	29.6

Exhibiting, as the average, for the year 1849, twenty-five feet; for 1850, thirty feet seven inches; and for 1851, twenty-nine feet five inches.

The average for 1850, in the months of April, May and June, was much increased by the shutting off, alternately, of one of the great lines on the Fifth avenue, at Murray Hill, during the process of lowering them, as described in the last annual report; but for this, the head maintained in 1851, for the whole year, would be less than that for 1850 by eight inches only, while it exceeds that of 1849 by four feet five inches.

When it is considered that during the last two years, thousands of water takers have been added, that the manuactures of the city have been greatly extended, numerous steam engines erected, and our mercantile marine much increased, it will be very apparent that the exertions of the department, in checking the waste of water, have not been without success.

Tables, showing the height of water in both divisions of the receiving reservoir, for the years 1849, 1850 and 1851, will be found in the appendix marked Schedule N; and Schedule O shows its average temperature, as delivered from service pipes in our dwellings, for each month in the year, carefully observed and compiled by Mr. De Forest, a member of this Board.

The severe and long continued drought of the past summer has tested the means of supply more thoroughly than at any former period since the erection of the works; the whole flow of the Croton river was turned through the aqueduct: for many consecutive weeks not a drop of water passed over the dam, and the lake formed by it, furnishing a reserve of five hundred millions of gallons, was gradually drawn down two feet seven and a half inches. The appearance at the dam during this time, was such as to command the most anxious attention, though not alarming, and has increased the confidence of the department in the adequacy and permanency of the supply.

PURITY OF THE WATER.

Since the period when the project of supplying the city with water was seriously commenced, and the sources from which it might be taken examined, and the various waters analyzed, nearly a whole generation of men has passed away, and in our ever changing, but rapidly increasing population, comparatively few remain, who are aware of the singular purity, and healthfulness of that beverage so unstintingly furnished to them from the Croton, through the magnificent erections provided by wise and liberal legislation.

To spread this knowledge, satisfy inquirers, and allay any fears that the timid may entertain, it is proposed to give some of these analyses, by extracting from a most comprehensive, careful and minute report, made by Prof. Benjamin Silliman, jr., to the Water Commissioners of Boston, October 29, 1845. In making these examinations, the professor states: "The waters were handed to me by numbers only, without any designation of their localities, and I still remain ignorant of their sources. They were contained in glass bottles, holding about two and a half gallons each, and fitted with well ground glass stoppers. I was informed that the bottles had been filled at the various points from which water had been taken, and that they had not been exposed to the action of the air since they had been collected."

These bottles were numbered from one to ten inclusive, and contained waters procured from as many sources; the results were noted under corresponding numbers, and the character of each sample tested by numerous experiments. For the present purpose, it will be sufficient to compare the results obtained from three of these bottles; No. 2, Croton water, "taken from the distributing reservoir, near the south-east corner, and near the outlet leading to the distributing reservoir, August 25, 1845: No. 4, Schuylkill water, with which Philadelphia is supplied, taken one to two hundred feet above the fore-bay in the pool of Fairmount dam, August 23, 1845; and No. 5, Long pond, or Cochituate lake, the source of supply to Boston, taken from the surface, where the depth was ten feet, and within one hundred and fifty to two hundred feet of the point of exit of the proposed aqueduct, July 19, 1845."

TRANSPARENCY, COLOR, SMELL AND TASTE.

No. 2 was a shade or two less transparent than No. 1, (from Mystic pond,) when viewed from above, and over white paper. On the bottom was seen a coat of fur of yellowish matter, as well as some pellets, of light spongy sediment in the angles of the bottle. Several lively animalcules were seen skipping about. It had a slight sapidity, and reminded one of the taste of marsh, or swamp water, so commonly perceived in the waters of lakes. No *odor* was perceived, and no unpleasant taste was left in the mouth, after retaining a portion of it for some time.

No. 4.—Not so transparent as the foregoing. It had a slight milkiness, arising apparently from the suspension of white earthy particles. The sediment was greater than in the last, and of a different quality, denser, darker colored, and not so easily distributed by agitation. No living animalcules were visible. Inodorous, and nearly or quite insipid, perfectly sweet, and like distilled water to the taste.

No. 5.—Transparent, and more colored than the foregoing, but by no means *highly* colored, quite free from floating particles; the bottom of the vessel nearly without furry matter adhering to it, and the sediment in the angles about equal to No. 2. No animalcules were seen by the naked eye. It was entirely inodorous and tasteless, resembling No. 4 in this respect; perfectly soft and pleasant to drink.

A part of the sediment from these ten samples of water was submitted to Professor J. W. Bailey, of West Point, by Mr. Silliman, and after classifying and giving the names of the several animalcules found in them, Professor Bailey adds, "You will see by the above that living soft, and hard shelled Polygastric Infusoria are present in all these waters, and so far, the evidence is *in favor* of their salubrity, for if they were not present it would necessarily be in consequence of something injurious to animal life being present in the water. Some of the species found are such as inhabit the purest lakes and streams, and many of them would be instantly destroyed in putrescent waters."

SOFTNESS.

"The test employed to determine this point was an alcoholic solution of common soap, commonly known as tincture of soap. In *hard* waters this test, when added in proper quantity, produces an immediate cloudiness, and a precipitate if the water is very hard. It should be remarked that lime and magnesia are the substances which produce the quality commonly known as *hardness* in waters."

The result of the test above mentioned, showed that the waters were hard in the order of their numbers, 2, 4, 5, that is No. 2 was hardest, and No. 5 softest. We can judge how little the word *hard* applies to either of them, when we reflect that in all our domestic operations, and toilet duties, no complaint was ever heard of a want of softness in the Croton water.

Various delicate, careful, and learned processes, were then adopted by the Professor, to ascertain the solid matter contained in one gallon of each of these waters. These occupy several pages of his report, and are too minute to be copied at length here ; the result is in grains :

No. 2, Croton water	10.93
" 4, Schuylkill	5.50
" 5, Long pond	1.85

Conducted with the same skill, were various other experiments made, to ascertain the presence of alkalies, acids, iron, lime, magnesia, gases, &c., the detail of which is omitted, because useful in a scientific, rather than in a popular view ; the volume per gallon of carbonic acid gas is here given as having a possible connection with the subsequent experiments detailed.

Volume per gallon of carbonic acid gas in cubic inches.

No. 2	17.817
" 4	3.879
" 5	10.719

Showing that Croton water contains the most, and Schuylkill the least of this gas.

Having given these necessary preliminary analyses, the next and great remaining step is to ascertain the

ACTION OF THESE WATERS ON METALLIC LEAD.

The Professor says, " Soon after they were received, I set on foot this enquiry, in order to have as much time as possible to give the results maturity. To imitate as closely as we were able the condition of a leaden pipe full of water, a series of well-stopped bottles, holding about a pint each, was prepared and numbered, and filled quite full of the several waters. A slip of lead, recently passed through the rolling mill, and quite bright and clean, was prepared, about half an inch wide, and ten inches in length, and was placed in each bottle. The weight of each slip of lead was noted carefully before the experiment, and all the bottles, (each containing its slip of bright lead,) were tightly stopped, and placed in a dark closet. The only condition of lead in water pipes, running full bore, which was not met in this arrangement, was in the fact, that as leaden pipes are soldered together, and to the pumps, or brass cocks, and as the solder and brass fixtures are more highly electro-negative than lead, chemical action is more likely to take place on it than if not thus situated. It would therefore have been well had there been an independent series of comparative experiments, instituted to determine this point, (by imitating the exact electrical condition of the lead,) but the time allotted to the research was too limited to allow of a repetition for this purpose."

A bottle of pure distilled water was at the same time placed aside with lead, under the same conditions, for the sake of comparison.

To place the results thus obtained fully before the reader, it will be necessary to copy them from No. 1 to No. 5, inclusive, though it is only between Nos. 2, 4 and 5, that we have hitherto instituted comparisons.

"After about five weeks, the bottles were opened and examined. The most visible, and apparently the greatest action, had taken place in No. 1, (from Mystic Pond.) The slip of lead in this water was tarnished, and in spots much corroded, particularly where it had touched the bottle, and the water was milky from the suspension of minute crystalline flakes. The lead sparkled from the adhesion of small white crystals, and its edges had a cauliflower, or fungus growth of yellowish semi-transparent matter. This action had increased steadily from the first day, and was quite evident within twenty-four hours from the commencement of the experiment.

No. 2, (Croton water.) The lead in this water looks as bright and fresh as the day it went in, and the water itself is not in the least turbid.

No. 3, (Spot pond.) The lead discolored in streaks, having a few puce-colored spots of a fungus growth, like organic matter; some of this brownish matter loosened from the lead, floated about like filaments of fibre.

No. 4, (Schuylkill water.) Quite bright, and not much acted on.

No. 5, (Long pond, or Cochituate lake.) Much as No. 3, with like brownish spots. Water clear, and no action, apparently, since the first few days."

The weight of the lead immersed in Croton water was *precisely* the same at the end of five weeks, as when put in. In eight of the other waters it was diminished, and in one, that from Cochituate lake, slightly increased,—showing that in every case except that of the Croton, some chemical action had taken place.

During the past summer, the department had occasion to take up from the street a lead service pipe, which had been in use eight years; it was sawed in pieces, very carefully examined, (without chemical tests,) and no change by oxydation or other action, could be detected, calculated in the slightest degree to create a doubt of the healthfulness of the water delivered through it.

It is, however, an admitted physiological fact, that some constitutions are so exceedingly sensitive to the poisons of lead, that it would not be wonderful, nor ought it to create surprise and alarm, if a few well-marked cases of injury from the use of Croton water, served through lead pipes, should occur. These would but form exceptions to a rule almost universal; for in a population of more than half a million, comprising persons from all countries and climates of every age, and all possible constitutional temperaments, in the daily and hourly use of this water, for every purpose in which organic life, civilization, and the arts can require it, no diminution of the general health has been observed; on the contrary, it has been promoted; the frequency and fatality of many diseases, have been sensibly arrested, and the average duration of human life probably prolonged.

The department is aware of but a single case in which any precautions can be necessary in the use of Croton water for drinking, and these only at elevations, where the supply is not constant. In the upper stories of buildings where the pipes are alternately wet and dry, caused by the daily variations of head in the Distributing reservoir, it is possible that the interior of the pipes by the united action of air and water, may be so oxydized, as that particles of carbonate of lead might be carried off, held in suspension by the water, and received in the stomach by drinking it; it would be imprudent, therefore, habitually to drink water from taps so circumstanced.

SEWERS AND DRAINS.

Schedule G shows the locality and length of the various sewers put under contract by the department during the past year, amounting to fifty-nine thousand one hundred and four feet, equal to eleven miles, and exceeding the aggregate of last year by more than two thousand feet; to this must be added nine hundred and eighty feet of sewers built at private expense, but under the direction and supervision of the department. With the public sewers above spoken of are connected one hundred and fifty-seven Receiving basins, and three thousand nine hundred and twenty-five lineal feet of culverts.

Schedule H exhibits the details of expenditure for repairing and cleaning the entire sewerage of the city for the year; these sewers reach a length of something more than eighty-one miles, making the cost of repairs and alterations $37 30 per mile, and of cleaning them $74 23 per mile. The former item has been swelled by the construction of a large number of man-holes; the number of these in some of the early built sewers, as was remarked in the last annual report, being insufficient to afford the required facilities to enter, examine, and clean them, and also by building the curved connections hereafter mentioned.

Ordinances directing the construction of some twenty-five sewers in various parts of the city were received too late in the season to be put under contract, and must lie over till the opening spring will permit the re-commencement of this kind of work.

The right angled connection of the sewer in Lexington avenue with that in Twenty-third street, was last year discovered to operate badly ; in heavy rains the superior volume and weight of water, flowing through the latter, prevented, in a great measure, the discharge into it from the former, causing an accumulation on the line of Lexington avenue, and frequently overflowing the adjacent cellars. The same remarks apply to the sewer connections at Madison avenue and Twenty-fifth street, and Twenty-fifth street and Lexington avenue. Upon a representation of these cases the Common Council directed that curves should be substituted in place of right angles, and to meet the expense of doing it appropriated the sum of fifteen hundred dollars ; the work has been done out of the general appropriation for sewers and drains, leaving the above amount undrawn from the treasury.

An attempt was made during the past summer to obtain the passage of an ordinance directing the building of a sewer from Sixth avenue, through Christopher street to Hudson river, principally for the purpose of drawing off a portion of the vast accumulation of drainage flowing through the sewer in Sixth avenue, which occasionally, in heavy rains, fills it in the neighborhood of St. Joseph's church, and overflowing through Receiving basins into the cellars originates claims for damages against the city. Objections were made by parties subject to assessment on the line of Christopher street, and the application failed.

It was necessary however, to do something to prevent, if possible, a recurrence of these disasters, and consequent repetition of similar claims, and as the readiest, perhaps the only means within the power of the department, the sewer in Fourteenth street has been connected with that in Sixth avenue by an easy curve, through which the latter will be relieved of a portion of its waters, possibly to an extent sufficient to prevent its overflow hereafter.

The public still complain, and with good cause, of the default of sewer contractors in not completing their several undertakings within the time limited in their contracts.

It is not easy to devise an efficient remedy for this evil. The city government has no direct pecuniary interest in the subject; it acts, in the construction of sewers, only as the agent for owners benefited by the work, who, by assessment levied on them for that purpose, furnish all the money to pay the contractor; the city could not, it is thought, enforce any claim for damage growing out of these defaults in time only, nor could the owners of property on the street by any combined movement recover aggregate damages in a single suit. Each party must make out his own case, and would recover from the contractor compensation for as much damage as he could prove, and no more. If any specific sum were inserted in the contract, as a penalty for its violation in regard to time, it is doubtful, to say the least, if it could be enforced against the contractor, and collected from him, the courts not favoring the principle of liquidated damages, but leaning rather to the common law rule of giving what can be proven on the trial, and leaving the jury to estimate the amount.

Even if it were otherwise, and the city could recover for breach of covenant in these cases, and a judgment should be docketted against a contractor for any considerable amount, it is not likely it would ever be enforced; sympathy would be invoked in his favor, and a respectful petition, numerously signed, presented to the Common Council, would probably produce the relief sought. The precedents in like cases all point to this result, and the enforcement of pecuniary penalties by the city government are of very rare occurrence, except the case be marked by some feature of especial atrocity.

The department, in settling the form of these contracts, has inserted clauses intended to protect the interests and the rights of all parties interested; the covenants are sufficiently minute, and meant to be comprehensive enough to cover the whole ground, and every effort is used to induce contractors to meet their undertakings with the same punctuality that they would if made with individuals; but so long as the departments of the city government are compelled by ordinance to award the contract in all cases to the lowest bidder, it will not be possible to escape the inconveniences and disappointments consequent upon their sometimes falling into the hands of careless and inefficient individuals.

The weekly receipts for permits to connect house drains with sewers appear in Schedule I, making an aggregate of $21,835 50, and exceeding the sum received from the same source last year by $2,858 50; Schedule J, shows the weekly payments into the city treasury; Schedule K, the amount of salaries paid during the year; Schedule L, the receipts and disbursements for "Statistical tables," and Schedule M, shows the cost of various special works done under resolutions of the Common Council, during the year. Many small appropriations, made for the purpose of placing fire hydrants, have not been drawn and it will be observed that under every head of general expenditure a surplus is left in the city treasury, notwith standing the amount of work done greatly exceeds that set forth in the estimates placed before the Common Council in December last, and upon which the appropriations were based.

Most of the subjects treated of in this report are of such general interest, and so closely connected with the daily pursuits, conveniencies, health and comfort of each individual, forming the great aggregate of our population, as well as with the future growth and general prosperity of the city, that it was deemed proper to notice each with some minuteness; in these considerations must be found an excuse for its length.

All which is respectfully submitted.

NICHOLAS DEAN, *President.*

CROTON AQUEDUCT DEPARTMENT,
December 31, 1851.

APPENDIX.

SCHEDULE A.

AQUEDUCT CONSTRUCTION ACCOUNT.

Cr.		
Balance unexpended from 1850..........		$5,553 90
Dr.		
Water Meters..................	$724 24	
Dredging Harlem river.........	2,408 00	
Plumbers' work-..............	236 16	
Law expenses.................	443 90	
Squire Wood, Jr., for damages..	100 00	
William Bolmer, do. ..	450 00	4,362 30
To credit of 1852............	....	$1,191 60

SCHEDULE B.

AQUEDUCT REPAIRS AND IMPROVEMENTS.

Cr.		
Balance unexpended from 1850		$9,959 21
Appropriation by Common Council for 1851		15,000 00
		24,959 21
Dr.		
Taxes, Westchester county	$389 54	
Labor	14,799 11	
Tools, and repairing tools	627 21	
Hardware	115 39	
Oil	34 54	
Iron work	379 37	
Lumber	848 53	
Sundries	610 65	
Wagon hire	323 50	
Cement and sand, lime, &c	1,800 40	
Paint	362 57	
Manure	371 75	
Grass seed	75 26	
Transportation	36 89	
Stone and brick	1,267 84	
Law expenses	446 85	
Cartage	586 91	
Blacksmith's work	33 37	
Embankment	284 33	
Surveying	40 00	
Powder for blasting	57 19	
Plumbers' work	53 08	
Trees and shrubbery, distributing reservoir	144 25	23,688 53
Balance lapsed in city treasury		$1,270 68

SCHEDULE 3.

WATER WORKS EXTENSION.

Cr.		
Balance unexpended from 1850		$4,594 16
Dr.		
Excavation	$250 00	
Pipes, branches, &c	468 31	
Tools and repairing	6 50	
Sundries	8 50	
Stop-cocks	1,181 85	
Surveys and drawings, Grand Reservoir	997 50	
Sundries	43 08	2,955 74
On hand, unexpended		$1,638 42

SCHEDULE C.

WATER PIPES AND LAYING.

Cr.		
Balance unexpended from 1850		$7,647 31
Appropriated by Common Council for 1851.		193,447 00
Forward		201,094 31
Dr.		
Fire hydrants	$3,324 00	
Repairing fire hydrants	1,078 45	
Brass cocks	3,145 06	
Hydrant and stop-cock boxes	2,760 99	
Branches, sleeves, caps, &c.	2,875 44	
Receiving reservoir	418 25	
Pig lead	8,653 60	
Office expenses	154 43	
Miscellaneous bills	515 00	
Tapper's boxes	834 82	
Advertising	124 74	
Postages	40 06	
Stop-cocks	12,749 84	
Repairing stop-cocks	838 88	
Packing yarn	711 67	
Fuel	478 07	
Office furniture	61 60	
Engineer's office	189 54	
Distributing reservoir	69 03	
Proving yard	1,900 25	
Forward	$40,923 72	201,094 31

SCHEDULE C.—CONTINUED.

WATER PIPES AND LAYING.

Cr.		
Amount brought forward		201,094 31
Dr.		
Brought forward	$40,923 72	
Wagon hire	661 01	
Repairing free hydrants	22 37	
Small castings	5,949 51	
Paving sand	138 86	
Excavation	5,522 99	
Omnibus fare	2 00	
Stationery	910 07	
Blasting	924 10	
Casualties	150 48	
Repairs, Bowling Green fountain	253 12	
Horse and wagon (purchased)	365 00	
Wages paid men	45,207 92	
Cartage	2,921 89	
Tapping pipes	1,864 87	
Hydraulic pump	148 83	
Fountain, Washington square	43 03	
Tools and repairing tools	2,827 44	
Iron Pipes, street mains	78,660 91	187,498 12
Balance lapsed in city treasury		$13,596 19

SCHEDULE D.

Bureau of Pipes and Sewers,
December 31st, 1851.

Report of the Water Purveyor, showing the sizes, length and locality of the Water Pipes, laid from January 1st, 1851, *to date.*

FOUR INCH PIPE.

			NO. FEET.
Jones' Lane,	between	Front and South streets	180
Weehawken st.	“	Christopher and Ames streets,	243
105th street,	“	5th and 6th avenues	500
Total			923

SIX INCH PIPE.

					NO. FEET.
East street,		between	Gouverneur and Jackson sts.,		600
Jackson street,		“	Front and East river,		200
Lexington avenue,		“	32d and 33d	“	300
Madison	“	“	34th and 37th	“	800
Fifth	“	“	30th and 42d	“	3,160
“	“	“	105th and 109th	“	1,080
Ninth	“	“	30th and 33d	“	780
“	“	“	43d and 49th	“	1,560
Eleventh	“	“	33d and 39th	“	1,560
“	“	“	43d and 48th	“	1,300
Avenue B,		“	13th and 14th	“	275
Thirteenth street,		“	Avenues C and B,	“	736
Forward					12,351

Brought forward........................12,351

Fourteenth	street,	bet.	Avenues A and B,	716
"	"	"	Avenue A and 1st avenue,	716
Seventeenth	"	"	10th avenue, west,	375
Twentieth	"	"	1st avenue and East river,	1,273
Twenty-second	"	"	2d " "	1,600
Twenty-seventh		"	10th avenue, west,	300
Twenty-eighth	"	"	10th and 11th avenues,	850
Thirtieth	"	"	2d and 3d avenues,	530
Thirty-first	"	"	8th and 10th avenues,	306
Thirty-second	"	"	9th and 10th avenues,	850
Thirty-third	"	"	Lexington and 3d avenues,	540
Thirty-fourth	"	"	9th and 10th avenues,	450
Thirty-fifth	"	"	5th and 7th avenues,	1,720
Thirty-sixth	"	"	5th and 6th avenues,	840
"	"	"	7th avenue and Broadway,	747
Thirty-seventh	"	"	Madison and 5th avenues,	500
Thirty-ninth	"	"	11th avenue, west,	486
Fortieth	"	"	3d and 4th avenues,	850
"	"	"	8th and 9th avenues,	850
Forty-first	"	"	" "	900
Forty-second	"	"	3d and 5th avenues,	1,870
"	"	"	7th and 10th avenues,	2,700
Forty-third	"	"	7th and 8th avenues,	400
Forty-fourth	"	"	8th and 9th avenues,	850
Forty-fifth	"	"	9th avenue, east,	235
Forty-seventh	"	"	8th and 9th avenues,	594
Fiftieth	"	"	3d and Lexington avenues,	500
Sixty-first	"	"	3d avenue and East river,	2,500
Eighty-sixth	"	"	" "	3,260
109th	"	"	3d and 5th avenues,	1,900

Total................................42,559

TWELVE INCH PIPE.

			NO. FEET.
Twenty-eighth	st., bet.	10th and 11th avenues,	860
Forty-eighth	" "	3d and 4th avenues,	800
Third avenue	"	40th and 60th streets,	5,200
"	" "	86th and 122 streets,	9,480
"	" "	123d and 129th streets,	1,680
Total			18,020

TWENTY INCH PIPE.

			NO. FEET.
Thirty-eighth	st., bet.	5th and 6th avenues,	1,020
"	" "	8th and 10th avenues,	1,750
Total			2,770

RECAPITULATION.

		NO. FEET.
Total length of	4 inch pipe	923
"	6 "	42,559
"	12 "	18,020
"	20 "	2,770
Grand total		64,272

or 12 miles and 912 feet.

JOHN P. FLENDER,
Water Purveyor, and
Chief of the Bureau of Pipes and Sewers.

SCHEDULE E.

SHOWING THE WEEKLY RECEIPTS FOR WATER RATES.

1851.					
Jan. 9	$4,259	84	Brought up	$146,299	74
" 16	5,211	37	July 10	14,667	37
" 23	2,477	42	" 17	27,235	94
" 30	1,739	77	" 24	49,364	38
Feb. 6	1,712	44	" 31	64,685	97
" 13	1,510	95	Aug. 7	38,658	23
" 20	1,860	50	" 14	5,297	53
" 27	1,122	25	" 21	5,168	91
Mar. 6	1,905	09	" 28	4,734	40
" 13	1,893	17	Sept. 4	6,277	01
" 20	1,034	30	" 11	5,980	04
" 27	1,453	25	" 18	4,478	77
Apl. 3	1,626	80	" 25	4,449	87
" 10	1,856	19	Oct. 2	4,752	50
" 17	1,679	70	" 9	4,133	46
" 24	1,900	81	" 16	5,811	25
" 30	3,836	75	" 23	9,163	86
May 8	14,446	44	" 30	9,002	16
" 15	11,761	14	Nov. 6	10,103	95
" 22	11,447	48	" 13	3,999	24
" 29	11,705	89	" 20	3,510	25
June 6	10,963	95	" 27	4,691	21
" 12	11,097	39	Dec. 4	3,400	36
" 19	9,751	74	" 11	3,041	99
" 26	13,839	29	" 18	9,140	26
July 2	15,205	82	" 25	3,616	35
Carried up	146,299	74		$451,665	00

SCHEDULE F.

SHOWING THE WEEKLY RECEIPTS FOR INTEREST ON UNPAID WATER RATES.

1851.			
Jan. 9	$212 05	Brought up	$2,863 64
" 16	271 55	Aug. 28	117 45
" 23	106 00	Sept. 4	199 95
" 30	118 35	" 11	120 73
Feb. 6	159 90	" 18	83 34
" 13	118 85	" 25	156 30
" 20	126 20	Oct. 2	132 94
" 27	70 00	" 9	147 40
Mar. 6	131 70	" 16	105 20
" 13	75 25	" 23	177 40
" 20	75 85	" 30	338 47
" 27	90 15	Nov. 6	496 05
Apl. 3	89 85	" 13	236 30
" 10	113 85	" 20	210 05
" 17	61 05	" 27	243 40
" 24	121 25	Dec. 4	296 75
" 30	328 75	" 11	288 09
Aug. 7	254 34	" 18	496 39
" 14	157 60	" 25	414 98
" 21	181 10		
Carried up	$2,863 64		$7,124 83

During the months of May, June and July, no interest was received, owing to a defect in the law, which was remedied at the extra session of the Legislature, held last summer.

SCHEDULE G.

Bureau of Pipes and Sewers,
December 31, 1851.

Report of the Water Purveyor, showing the locality, length and size of all Sewers, and the number of Receiving Basins and Culverts, for which contracts were made by the Croton Aqueduct Department, from January 1st, 1851, to date.

STREET.	BETWEEN	Length.	Size.	Rec. Bs. and Cul.
Fulton street..	Broadway and Greenwich streets.....	1.000	egg, 4 by 2.8	3
Broadway.....	Canal and White streets.............	536	"	2
Do.	Spring and Houston streets..........	872	"	2
Twenty-first st.	Hudson river and 8th avenue..........	2.151	cir., 4 feet.	4
Seventh avenue	14th ond 17th sts..................	1.550	egg, 4 by 2.8	6
Seventeenth st.	6th and 7th avenues................			
Avenue A.....	16th and 18th streets..............	2.200	"	6
Seventeenth st,	Avenue A and First avenue.........			
Sixteenth st...	Avenue A and Livingston place.....			
Eighteenth st..	4th avenue and Broadway...........	390	"	1
Thirty-eighthst	6th and 8th avenues................	1.650	"	2
Columbia street	Stanton and Rivington streets........	328	"	
City Hall place	Duane and Chambers streets.........	200	"	
Warren street.	Chapel and Greenwich streets......	668	"	2
Greenwich st..	Warren and Murray streets.........			
Hudson street..	Clarkson and Le Roy streets.......	600	"	2
Le Roy street..	Hudson, and 300 feet east..........			
37th street.....	9th avenue, and 375 feet west........	425	"	
Thirty-first st..	Madison and 4th avenues............	415	"	
Do.	8th and 7th avenues.................	815	"	
Twenty-first st.	Third and Lexington avenues........	400	"	1
Fourth-street..	Bowery and Lafayette place.........	400	"	1
Ninth-street...	Third and Fourth avenues...........	340	"	2
Prince street...	Crosby and Marion streets...........	160	"	2
Broome street..	Crosby and Broadway...............	124	"	
Thirty-sixth st.	8th and 7th avenues.................	930	"	2
Do.	Madison and 4th avenues............	336	"	
Mercer street..	Bleecker and Houston streets........	340	"	
Sixth avenue..	37th and 40th streets..............	2.489	"	2
38th street.....	6th and 5th avenues...............			
39th street.....	do. do.			
Duane street...	Chapel and Hudson streets...........	201	"	2
Thirty-fifth st..	6th and 5th avenues.................	885	egg. 4 by 2.8	
Fourteenth st..	10th avenue and Hudson River......	420	cir. 5.6.5.	2
Franklin street.	Chapel and Broadway...............	857	"	2
Sixteenth st...	East river and Avenue A	756	"	2
Hester street..	Centre and Orange streets...........	255	"	2

SCHEDULE G—CONTINUED.

STREET.	BETWEEN	Length.	Size.	Rec. Bs. and Cul.
33d street......	Madison and 5th avenues............	450	egg, 4 by 2.8	1
Pearl street...	Broad and Coenties alley............	400	"	
Avenue A.....	18th and 22d streets................	1.004	"	6
27th street.....	10th avenue and Hudson R..........	980	"	2
36th street.....	6th and 5th avenues.................	870	"	
Tenth avenue..	23d and 24th streets...............	680	"	2
24th street.....	10th avenue, and 475 feet east......			
Greene street..	Canal and Houston streets.........	2.992	ell. 3.6 by 4.6	12
Houston street.	Greene and Broadway.............		egg, 4 by 2.8	
Gold street....	Ferry and Frankfort streets.........	200	egg, 4 by 2.8	
39th street.....	8th avenue, and 350 feet east........	400	"	
Gold street....	Spruce and Fulton streets............	440	"	3
Chatham street	Pearl and North William streets.....	815	"	3
Ninth avenue..	45th and 51st streets................	1.575	egg, 5 by 3.4	6
48th street.....	8th and 9th avenues.................	450	egg, 4 by 2.8	
Elm street.....	Canal and Howard streets.........	540	egg, 4 by 2.8	4
Howard street.	Elm and Crosby streets...........			
Tenth avenue..	36th and 42d streets................	1.550	egg, 5 by 3,4	2
Do.	42d and 46th streets................	1.060	"	6
Bleecker street.	Broadway and Bowery..............	1.010	egg, 4 by 2.8	5
Oliver (rebuilt)	South and Water streets............	200	cir. 4 feet.	
Eighth avenue.	53d and 54th streets...............	853	egg, 5 by 3.4	2
54th street.....	8th avenue and Broadway.........			
26th street.....	3d and 2d avenues...................	348	egg, 4 by 2.8	1
39th street.....	5th and Madison avenues............	600	"	2
49th street.....	8th avenue and Broadway...........	565	"	
Varick street..	Canal, and 100 feet south of Laight st.	411	"	2
Leonard street.	Chapel, and 144 feet east......	191	"	
Delancey street	Essex and Bowery..................	1.640	"	13
Prince street...	Marion and Mulberry streets......	771	"	3
Mulberry street	Prince and Houston streets........			
35th street.....	2d and 3d avenues..................	561	"	
11th street.....	Avenue A and 1st avenue...........	710	"	2
City Hall place	Pearl and Duane streets.............	374	"	
Walker street.	Church and Broadway...............	477	"	2
12th street.....	6th and 7th avenues...............	1.016	"	1
Seventh avenue	12th and 13th streets..............			
Lispenard st...	Church, to opposite 41..............	190	ell, 3.6 by 2.6	1
Greenwich st..	Canal and Spring streets............	490	egg, 4 by 2.8	2
16th street.....	6th and 7th avenues.................	800	"	
37th street.....	8th and 7th avenues.................	820	"	
13th street.....	Avenues A and C....................	1.416	"	4
Renwick st....	Canal and Spring streets............	530	"	
First avenue...	24th and 25th streets...............	208	"	
William street.	Spruce and Frankfort streets.........	226	"	
Grand street...	Bowery and Christie streets........	1.310	egg, 5 by 3.4	5
Christie steet..	Grand and Walker streets..........		egg, 4 by 2.8	
Hester street...	Christie and Bowery..............			
37th street.....	6th avenue and Broadw	215	"	
Stanton street.	Pitt and Suffolk street...............	1.000	ell. 3.6 by 4.6	8
Avenue D......	8th and 10th streets................	480	egg, 4 by 2.8	3
36th street.....	Madison and 5th avenues............	356	"	
Prince street...	Broadway and Greene street.........	400	"	1
Greene street..	Houston and Bleecker streets.........	308	"	
Beekman street	Gold and William streets............	310	"	

SCHEDULE G—Continued.

STREETS.	BETWEEN	Length.	Size.	Rec. Bs and Cul.
20th st (rebuilt)	5th avenue, and 200 feet east	210	egg, 4 by 2.8	
8th street	Avenue C, and 234 feet east	270	"	
Avenue B	13th and 14th streets	220	"	1
Columbia street	Rivington, and 200 feet south	225	"	
Broome street	Crosby and Elm streets	694	"	
Elm street	Broome and Spring streets			
37th street	2d and 3d avenues	600	"	
29th street	corners, 11th avenue	.....	......	2
Cross street	" Orange street	......	......	1
24th street,	" 2d avenue	......	......	1
	Total	58.104		157

SEWERS BUILT AT PRIVATE EXPENSE.

Fourth avenue, between 18th and 19th streets	250 feet
Cherry street, between Roosevelt street, west	150 "
Twenty-second street, between 9th and 8th avenues	180 "
Liberty street, rebuilt between Greenwich and Temple streets	400 "
Total	960 "

RECAPITULATION.

Of sewers by contract	58,104 lineal feet.
" at private expense	980 " "
Total	59,084 feet, or eleven miles 1004 feet.
Of Receiving Basins by contract	157
" Culverts " " about	3,925 lineal feet.

JOHN P. FLENDER,
Water Purveyor, and Chief of Bureau of Pipes and Sewers.

SCHEDULE H.

SEWERS, REPAIRING AND CLEANING.

Cr.		
Unexpended balance from 1850...........		$2,075 78
Appropriation by Common Council for 1851		10,000 00
Special appropriation to build Sewer, from Police Station, Leonard street..........		500 00
		12,575 78
Dr.		
New man-holes, and repairing sewers.....................	$1,551 00	
Ventilators..................	148 14	
Repairing basins and culverts..	666 40	
Cartage......................	50 11	
Sundries.....................	147 55	
Tools, and repairing tools......	39 11	
Casualties....................	324 88	
Sewer in 6th street, between 2d and 3d avenues............	2 50	
Castings for man-holes........	656 11	
Wages paid men.............	5,775 85	
To finishing sewer in 13th street, Cassidy, contractor.........	390 02	
Sewer in Leonard street, from Police station..............	537 87	
Sewer improvements, curved connections.................	941 24	11,230 78
Balance lapsed in city treasury.	....	$1,345 00

SCHEDULE I.

SHOWING THE WEEKLY RECEIPTS FOR PERMISSION TO MAKE CONNECTIONS WITH THE PUBLIC SEWERS.

1851.			
Jan. 9	$240 00	Brought up	$11,277 00
" 16	205 00	July 10	395 00
" 23	380 00	" 17	420 00
" 30	128 00	" 24	345 00
Feb. 6	155 00	" 31	246 00
" 13	30 00	Aug. 7	590 00
" 20	310 00	" 14	417 50
" 27	270 00	" 21	430 00
Mar. 6	555 00	" 28	380 00
" 13	400 00	Sept. 4	520 00
" 20	310 00	" 11	360 00
" 27	571 00	" 18	345 00
Apl. 3	375 50	" 25	370 00
" 10	350 00	Oct. 2	488 00
" 17	627 50	" 9	510 00
" 24	435 00	" 16	428 00
" 30	1,000 00	" 23	530 00
May 8	740 00	" 30	460 00
" 15	490 00	Nov. 6	130 00
" 22	340 00	" 13	750 00
" 29	610 00	" 20	456 00
June 6	690 00	" 27	645 00
" 12	655 00	Dec. 4	400 00
" 19	550 00	" 11	395 00
" 26	495 00	" 18	448 00
July 2	365 00	" 25	100 00
Carried up	$11,277 00		$21,835 50

SCHEDULE J.

SHOWING THE WEEKLY PAYMENTS INTO THE CITY TREASURY, PER RECEIPTS OF S. KNAPP, ESQ., CITY CHAMBERLAIN.

1851.	
Jan. 9........	4,711 89
" 16........	5,687 92
" 23........	2,963 42
" 30........	1,986 12
Feb. 6........	2,027 34
" 13........	1,659 80
" 20........	1,796 70
" 27........	1,462 25
Mar. 6........	2,591 79
" 13........	1,868 42
" 20........	1,420 15
" 27........	2,114 40
Apl. 3........	2,092 15
" 10........	2,320 04
" 17........	2,368 25
" 24........	2,457 06
" 30........	5,165 50
May 8........	15,186 44
" 15........	12,251 14
" 22........	11,787 48
" 29........	12,315 89
June 6........	11,653 95
" 12........	11,752 39
" 19........	10,301 74
" 26........	14,334 29
July 2........	15,570 82
" 10........	15,062 37
Carried up...	$174,909 71
Brought up..	$174,909 71
July 10........	913 66
" 17........	27,655 94
" 24........	49,709 38
" 31........	64,931 97
Aug. 7........	39,502 57
" 14	5,872 63
" 21........	5,780 01
" 28........	5,231 85
Sept. 4........	6,996 96
" 11........	6,460 77
" 18........	4,907 11
" 25........	4,976 17
Oct. 2........	5,373 44
" 9........	4,790 86
" 16........	6,344 45
" 22........	9,871 26
" 30........	9,800 63
Nov. 6........	10,730 00
" 13........	4,985 54
" 20........	4,176 30
" 27........	5,579 61
Dec. 4........	4,097 11
" 11........	3,725 08
" 11........	329 60
" 18........	10,084 65
" 25........	4,131 33
	$481,868 59

SCHEDULE K.

SALARIES.

Received from Comptroller on warrants....................	....	$23,870 00
Paid Nicholas Dean, Pres. Commis.	$2,000 00	
" Theo. R. De Forest, Asso. "	2,000 00	
" Alfred W. Craven, Chief Eng.	2,000 00	
" Edward H. Tracy, Engineer.	2,000 00	
" John P. Flender, Water Purveyor, and Chf. of B. of Sew.	1,500 00	
" Revo C. Hance, Water Reg.	1,500 00	
" Hy. L. Robertson, C. to Pres.	1,000 00	
" W. Fardon, Dep. Water Reg.	1,000 00	
" Alex. F. Dodge, Chief Clerk Bureau of Sewers..........	1,000 00	
" William V. Lecount, Clerk to Water Register............	600 00	
" Edmund E. Dean, Clerk to Water Register............	600 00	
" John M. Morenus, Clerk to Water Register............	600 00	
" Seymour V. Moody, Clerk to Water Register............	600 00	
" Gilbert H. White, Clerk to Water Register............	600 00	
" Thomas Hook, Clerk to Water Register	600 00	
" D. Adamson, Sup. Cro. Dam.	600 00	
Carried forward..........	$18,200 00	$23,870 00

SCHEDULE K.—CONTINUED.

Brought forward..........	$18,200 00	$23,870 00
Paid James Scott, Sup. Sing-Sing	548 00	
" Barney See, " Tarrytown	470 00	
" Jas. Bremner, " Dobb's Fer.	470 00	
" *Abm. Scudder, " Yonkers	195 81	
" James Berwick, " "	274 19	
" Jno. L. Berrian, " Fordham	470 00	
" Jacob Moore, " Highbridge	470 00	
" John Geary, Keep. Rec. Res.	730 00	
" *Simeon Pomeroy, Dis. Res.	464 07	
" Thos. C. Cooper, " "	265 93	
" James Gulick, Proving Yard.	626 00	
" John J. Concklin, Messenger	470 00	
" John D. Vanburk, Messenger Engineers' Office..........	216 00	$23,870 00

---

* Not now in the service of the Department

SCHEDULE L.

STATISTICAL TABLES.

Cr.		
Unexpended balance from 1850,		$1,062 61
Appropriation by Common Council, 1851		1,500 00
		$2,562 61
Dr.		
Making maps	$93 33	
Binding maps	88 62	
Ivory scales	4 00	
For returns of new buildings		
Captain 2d Ward Police	9 00	
“ 3d “ “	11 75	
“ 5th “ “	10 00	
“ 7th “ “	9 00	
“ 8th “ “	7 00	
“ 9th “ “	74 50	
“ 10th “ “	6 50	
“ 11th “ “	26 75	
“ 12th “ “	46 50	
“ 13th “ “	8 25	
“ 15th “ “	17 25	
“ 16th “ “	262 50	
“ 17th “ “	138 75	
“ 18th “ “	257 50	1,071 20
Balance in hand unexpended		$1,491 41

SCHEDULE M.

COST OF VARIOUS WORKS DIRECTED BY THE COMMON COUNCIL, FOR WHICH SPECIAL APPROPRIATIONS WERE MADE.

Sewer in Twentieth street, between Fifth and Sixth avenues:

Appropriation	$3,000 00
Cost	2,583 72
Lapsed in Treasury	$416 28

Sewer in Oliver street, from Water street to East river:

Appropriation	$1,000 00
Cost	913 77
Lapsed in Treasury	$86 23

Sewer in Twentieth street, Fifth avenue to Broadway:

Appropriation	$750 00
Cost	719 97
Lapsed in Treasury	$30 03

Surveys for sewerage in the basin between Forty-seventh and Sixtieth streets, and Fifth avenue and East river:

Appropriation	$250 00
Cost	210 00
Lapsed in Treasury	$40 00

SCHEDULE N.

Showing the average depth of water in both divisions of the Receiving Reservoir, for the years 1849, 1850, 1851.

	North Division.		South Division.	
	Feet.	Inches.	Feet.	Inches.
1849—January	20	..	30	..
February	20	..	30	..
March	19	11	29	11
April	19	8	29	8
May	16	9	24	2
June	19	7	29	7
July	19	7	29	7
August	19	8	29	8
September	19	9	29	9
October	19	10	29	10
November	15	4	25	7
December	3	2	30	..
Average for the year	17	9	28	11
1850—January	15	4	26	5
February	19	5	29	5
March	19	10	29	10
April	19	10	29	10
May	19	4	29	4
June	19	5	29	5
July	18	..	28	..
August	18	3	28	3
September	18	9	28	9
October	18	11	28	11
November	19	2	29	2
December	16	10	26	10
Average for the year	18	7	28	7
1851—January	16	2	26	4
February	18	5	28	5
March	19	3	29	3
April	19	7	29	7
May	19	6	29	6
June	18	3	28	3
July	17	11	27	11
August	18	3	28	3
September	17	8	27	8
October	18	2	28	2
November	19	1	29	1
December	19	..	29	..
Average for the year	18	5	28	5

SCHEDULE O.

Showing the average temperature of the Croton water for eleven months of the year 1851, as delivered from service pipes within our dwellings; compiled by Theodore R. De Forest, Associate Commissioner of the Department;—the original tables show the highest and lowest temperature for each month, as well as the mean; and also the temperature of the atmosphere at corresponding periods of time. Enough is given below to satisfy ordinary inquirers:

TIME OF OBSERVATION—12 M.

January (not observed.)	
February	42°
March	47
April	51
May	59
June	67
July	74
August	73
September	72
October	64
November	54
December	43

CABOT SCIENCE LIBRARY

CABOT
MAY 11 1997
BOOK DUE

3 2044 044 832 723

3 2044 044 832 723